IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of: Ruediger Bauder, *et al.*

Serial No.:   09/911,139

Filed: July 23, 2001

For: DIGITAL PREDISTORTION TECHNIQUE FOR WCDMA WIRELESS
COMMUNICATION SYSTEM AND METHOD OF OPERATION
THEREOF

Grp./A.U.:   2631

Examiner: Khanh C. Tran   Conf. No.:   2375

Commissioner for Patents
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ATTENTION: Board of Patent Appeals and Interferences

Sirs:

APPEAL BRIEF UNDER 37 C.F.R. §41.37

This is an appeal from a Final Rejection dated May 30, 2006, of Claims 1-20. The

Appellants submit this Brief with the statutory fee of $500.00 as set forth in 37 C.F.R.§41.20(b)(2),

and hereby authorize the Commissioner to charge any additional fees connected with this

communication or credit any overpayment to Deposit Account No. 08-2395.

This Brief contains these items under the following headings, and in the order set forth below in accordance with 37 C.F.R. §41.37(c)(1):

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is the Assignee, Agere Systems, Inc.

II. RELATED APPEALS AND INTERFERENCES

No other appeals or interferences will directly affect, be directly affected by, or have a bearing on the Board's decision in this appeal.

III. STATUS OF THE CLAIMS

Claims 1-20 are pending in this application and have been rejected under 35 U.S.C. 103(a). Each of the pending claims and are being appealed.

IV. STATUS OF THE AMENDMENTS

The present Application was filed on July 23, 2001. The Appellants filed a first Amendment on February 28, 2005, in response to a first Examiner's Action mailed November 30, 2004. The Examiner entered the first Amendment and subsequently issued a Final Rejection on June 29, 2005. The Appellants then filed a first Request for Reconsideration on August 29, 2005. The Examiner responded with a first Advisory Action that maintained the final rejection. Subsequently, the Appellants filed a Request for Continued Examination on October 28, 2005, that amended the pending claims.

The Examiner entered the last amendment and issued a second Examiner's Action mailed December 13, 2005. The Appellants argued against the second Examiner's Action in a response filed March 9, 2006. Subsequently, the Examiner issued a second Final Rejection on May 30, 2006. The Appellants then filed a Notice of Appeal and a Pre-Appeal Brief Request for Review on July 21, 2006.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention is directed, in general, to wireless communications and, more specifically, to a digital predistortion technique for a Wideband Code-Division Multiple Access (WCDMA) wireless communication system and method of operating the same. (*See* paragraph 1.)

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The present invention recognizes that a feedback loop is advantageous to track a change in power amplifier parameters, but that a dedicated feedback loop will substantially increase the overall complexity of a transceiver. (*See* paragraph 26.) The present invention introduces the broad concept of employing a receive chain of a WCDMA transceiver, instead of dedicated hardware, to create a closed feedback loop designed to reduce distortion in the output of a WCDMA transceiver. (*See* paragraph 10.)

Independent Claim 1 is directed to a WCDMA transceiver having an antenna, including: (1) a transmit chain having a lookup table that provides coefficients to a digital predistorter based on power indicators and (2) a predistorter training circuit, coupled to the transmit chain, that employs a receive chain of the WCDMA transceiver during a training mode to provide a digital compensation signal that is a function of an output of the transmit chain. The predistorter training circuit also employs both the power indicators and the digital compensation signal to cause the lookup table to provide alternative coefficients to the digital predistorter thereby to reduce distortion in the output. During the training mode, the antenna is disconnected from the transmit chain. (*See* paragraphs 9 and 32.)

In one embodiment, a transceiver includes a transmit channel 100 including a predistorter 140. (*See* paragraphs 21 and 22.) In FIGURE 2, an embodiment of a predistortion system 200 is illustrated that is suited for the WCDMA transmit channel 100 and utilizes a receive chain 207 as a feedback loop for altering predistortion coefficients. (*See* paragraph 26.) The predistortion system 200 includes a transmit chain 205 having a lookup table 225 and a predistortion training circuit 290. (*See* paragraphs 31, 33 and Figure 2.) The training circuit 290 is employed to update the alternative predistortion coefficients through the digital compensation signal to cause the lookup table 225 to

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provide alternative coefficients to the predistorter 220. The lookup table 225 employs the power indicators I^2 plus Q^2. (*See* paragraph 36 and Figure 2.) The predistorter training circuit 290, coupled to the transmit chain 205, employs the receive chain 207 during a training mode to provide the digital compensation signal that is a function of an output of the transmit chain 205. The predistorter training circuit 290 employs both the power indicators and the digital compensation signal to cause the lookup table 225 to provide alternative coefficients to the digital predistorter 220 thereby to reduce distortion. (*See* paragraphs 33, 36 and Figure 2.) During the training mode, the antenna 267 is disconnected from the transmit chain 205. (*See* paragraph 32 and Figure 2.)

Independent Claim 8 is directed to a method of reducing distortion in an output of a WCDMA transceiver having an antenna, including: (1) employing a lookup table to provide coefficients to a digital predistorter of a transmit chain based on power indicators, (2) employing a receive chain of the WCDMA transceiver during a training mode to provide a digital compensation signal that is a function of an output of the transmit chain, wherein the antenna is disconnected from the transmit chain during the training mode and (3) employing both the power indicators and the digital compensation signal to cause the lookup table to provide alternative coefficients to the digital predistorter. (*See* paragraphs 32, 51-53 and Figure 3.)

In one embodiment illustrated in Figure 3, a lookup table provides coefficients in a predistorter in a step 350 based on power indicators received in a step 320. (*See* paragraphs 51, 53 and Figure 3.) A receive chain of a WCDMA transceiver is employed to create the digital compensation signal as a function of an output of a transmit train in a step 330. In the lookup table step 340, both the power indicators of the step 320 and the digital compensation signal are employed by the lookup table step 340 to cause the lookup table to provide alternative coefficients in the step

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predistorter 350. (*See* paragraph 53 and Figure 3.) During a training mode of the WCDMA transceiver, the antenna is disconnected. (*See* paragraph 32 and Figure 3.)

Independent Claim 15 is directed to a WCDMA transceiver having an antenna, including: (1) a transmit chain, having: (1A) a digital predistorter, (1B) a lookup table that provides coefficients to the digital predistorter based on power indicators, (1C) an interpolator coupled to an output of the digital predistorter, (1D) a digital to analog converter coupled to an output of the interpolator, (1E) a low pass filter coupled to an output of the digital to analog converter, (1F) a quadrature modulator coupled to an output of the low pass filter, and (1G) an amplifier coupled to an output of the quadrature modulator; (2) a receive chain, having: (2A) a quadrature De-modulator, (2B) a low pass filter coupled to an output of the quadrature De-modulator, (2C) an analog to digital converter coupled to an output of the low pass filter and (2D) a predistorter training circuit, coupled to the transmit chain, that employs the receive chain during a training mode to provide a digital compensation signal that is a function of an output of the transmit chain and employs both the power indicators and the digital compensation signal to cause the lookup table to provide alternative coefficients to the digital predistorter thereby to reduce distortion in the output, wherein the antenna is disconnected from the transmit chain during the training mode. (*See* paragraphs, 26, 28, 32-33 and Figures 1-2.)

In one embodiment, the present invention discloses a predistortion system 200 which utilizes a receive chain 207 as a feedback loop for altering pre-distortion coefficients. The predistortion system 200 provides an efficient digital baseband linearization method suited for a WCDMA transceiver. (*See* paragraph 26.) The transmit chain 205 has a digital predistorter 220, a lookup table 225 which forms a basis for the digital predistortion functionality of the predistorter 220, an

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interpolator 230, a DAC 240, a LPF 250, a quadrature modulator 255, and a power amplifier 260. (*See* paragraph 28 and Figure 2.)

The receive train 207 has a quadrature demodulator 270, which extracts incoming information and demodulates the signal into a single one-dimensional analog value. This demodulated analog signal then passes through an LPF 275, perhaps a Butterworth filter, and then is converted into digital form by an analog to digital converter (ADC) 280. Finally, the now digital coefficients corresponding to the demodulated signal are received by a training circuit 290, which may then update the lookup table 225 with appropriate and/or alternative coefficients, as a function of the output of the transmit train 205, through a digital compensation signal to reduce distortion in the output of the PA 260. (*See* paragraph 33 and Figure 2.)

During a "training" mode of operation, however, (to be described in more detail below) for the predistorter 220, the transmit chain 205 and the receive chain 207 cooperate through the use of the coupler 265 to form a loop through the receive train 207, and the antenna 267 is disconnected from the transmit chain 205. (*See* paragraph 32.)

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The first issue presented for consideration in this appeal is whether Claims 1, 4-6 and 8-13, as rejected by the Examiner, are patentably nonobvious in accordance with 35 U.S.C. §103(a) over U.S. Patent No. 6,141,390 to Cova ("Cova") in view of U.S. Patent No. 6,275,685 to Wessel, *et al.*, ("Wessel") and in further view of U.S. Patent No. 6,054,896 to Wright, *et al.*, ("Wright"). The second issue presented for consideration in this appeal is whether Claim 2, as rejected by the Examiner, is patentably nonobvious in accordance with 35 U.S.C. §103(a) over Cova in view of Wessel and in further view of U.S. Patent No. 6,373,902 to Park ("Park"). The third issue presented for consideration in this appeal is whether Claim 3, as rejected by the Examiner, is patentably nonobvious in accordance with 35 U.S.C. §103(a) over Cova in view of Wessel and in further view of U.S. Patent No. 6,240,144 to Ha ("Ha"). The fourth issue presented for consideration in this appeal is whether Claims 7 and 14, as rejected by the Examiner, are patentably nonobvious in accordance with 35 U.S.C. §103(a) over Cova in view of Wessel and in further view of U.S. Patent No. 6,288,610 to Miyashita ("Miyashita"). The fifth issue presented for consideration in this appeal is whether Claims 15-20, as rejected by the Examiner, are patentably nonobvious in accordance with 35 U.S.C. §103(a) over Cova and Wessel and in further view of Park, Ha and Wright.

VII. APPELLANTS' ARGUMENT

The inventions set forth in independent Claims 1, 8 and 15 and their respective dependent claims are not obvious over the references on which the Examiner relies.

<u>Rejection under 35 U.S.C. 103(a) over Cova in view of Wessel and in further view of Wright</u>

A.   Rejection of Claims 1 and 8

The Examiner has rejected independent Claims 1 and 8 under 35 U.S.C. §103(a) as being unpatentable over Cova in view of Wessel and in further view of Wright. The Appellants respectfully disagree since the cited references, individually or in combination, do not teach or suggest employing a receive chain of a WCDMA transceiver during a training mode to provide a digital compensation signal that is a function of an output of a transmit chain as recited in independent Claims 1 and 8.

Cova, Wessel and Wright disclose transmit chains with dedicated feedback loops. (*See* for example, Figures 4 of Cova and Wessel and Figure 26 of Wright.) The Examiner asserts that one of ordinary skill in the art would have recognized that the feedback loop in Figure 4 of Cova employs a receiver as a feedback loop since the feedback loop would include the same components of a receiver. (*See* Examiner's Final Rejection, page 3.) The Appellants respectfully disagree since this simply discloses that components of a receive chain can be used in a dedicated feedback loop. Cova provides no suggestion that the feedback loop is part of a receive chain nor provides any enablement of employing a receive chain during a training mode. Cova does not recognize advantageously employing a receive chain instead of a dedicated feedback loop. Instead, Cova is concerned with more accurately compensating for power amplifier distortion of a RF transmitter by using a straight inverse modeling scheme. (*See* column 2, lines 60-64.)

The Examiner specifically refers to column 4, lines 42-45, of Cova to assert that one of ordinary skill of the art would recognize that the transmitter in Cova is part of a transceiver. Column 4, lines 42-45 of Cova, however, discloses that the transmitter of Figure 4 is adapted to use as a

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paging transmitter in a paging system but can be used in other radio frequency applications. (*See* Examiner's Final Rejection, page 2.) Thus, Cova suggests the transmitter of Figure 4 can be a transmitter in other RF systems besides a paging system but does not suggest that Figure 4 includes any portion of a receive chain. As such, the Appellants fail to see where Cova suggest employing a receive chain during a training mode. Instead, the Examiner appears to impermissibly use the teaching of the present invention to provide motivation to create a rejection based on Cova.

Again, Cova discloses that Figure 4 is a block diagram of a transmitter using a predistortion system employing a feedback loop. (*See* column 3, lines 58-60, column 4, lines 34-36 and 50-54, and Figure 4.) The feedback loop is not a receiver but instead provides the signal that was actually transmitted by the transmitter 400 to the trainer 431 for the predistorter 407. (*See* column 6, lines 64-66 and Figure 4.) Instead of a receive train of a transceiver, Figure 4 specifically discloses a dedicated feedback loop of the transmitter 400 that receives output signals from the power amplifier and performs the appropriate down conversions thereon and provides the converted output signal to the trainer 431. (*See* column 4, lines 50-54; column 9, lines 49-52; column 18, line 62 to column 19, line 40 for another embodiment of a dedicated feedback loop; and Figures 4, 6 and 15.)

Wright reinforces using a feedback loop but not using a receive chain during a training mode. The Examiner asserts that column 34 of Wright teaches directing a small amount of an output signal to a receiver using a directional coupler as in Figure 26. (*See* Examiner's Final Rejection, page 3.) The Appellants do not find this teaching in the cited section of Wright. On the contrary, Wright teaches using a directional coupler to take a small amount of an RF signal sent to an antenna for transmission and using the small amount of the signal for downconversion. Wright does not teach or suggest the down conversion is performed employing a receive chain. (*See* column 34, lines 24-40.)

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Wessel also does not cure this deficiency of Cova. Wessel discloses a circuit for predistorting a signal. (*See* Wessel, column 2, lines 24-27 and Figure 4.) As in Cova, however, the predistortion circuit is a feedback circuit of a transmitter. (*See* Wessel, Abstract and Figures 4 and 7.) Wessel makes no teaching or suggestion that the predistortion circuit employs a receive chain of a transceiver. Accordingly, the cited combination of Cova, Wessel and Wright, does not teach or suggest employing a receive chain of a transceiver during a training mode as recited in independent Claims 1 and 8.

Furthermore, the Examiner also recognizes that neither Cova nor Wessel teach or suggest an antenna is disconnected from a transmit chain during a training mode. To cure this deficiency, the Examiner cites Wright and asserts that it would have been obvious for one skilled in the art to combine the teachings of Wright with Cova. (*See* Examiner's Final Rejection, pages 3-5.) Cova, however, is directed to a trainer that monitors the actual data or voice signals being transmitted to implement in a predistortion scheme such that normal data or voice transmissions need not be interrupted. (*See* column 7, lines 8-14.) Wright, on the other hand, discloses various techniques for stimulating analog amplification chains and training compensation circuits when a signal is not being transmitted. (*See* column 4, lines 57-59.) Thus, one skilled in the art would not be motivated to combine the teaching of Wright with the teachings of Cova since Cova teaches a trainer that operates when signals are **being transmitted** and Wright teaches training compensation circuits that operate when a signal is **not being transmitted**. Wright, therefore, is improperly combined with Cova.

Thus, the cited combination does not teach or suggest each element of independent Claims 1 and 8 and fails to provide a *prima facie* case of obviousness of Claims 1 and 8. Additionally, the cited references do not provide a suggestion or teaching to motivate one of ordinary skill in the art to

arrive at the claimed invention. Instead, the cited references are directed to transmitters and are being applied with the benefit of hindsight provided by the present invention. Accordingly, the Appellants respectfully request the Board of Patent Appeals and Interferences reverse the Examiner's §103(a) rejection of Claims 1 and 8 and allow issuance thereof.

B.   Rejection of Claim 4

The Examiner has rejected Claim 4 under 35 U.S.C. §103(a) as being unpatentable over the cited combination of Cova, Wessel and Wright. The above argument establishing the nonobviousness of independent Claim 1 is incorporated herein by reference. Dependent Claim 4 additionally requires that the predistorter training circuit includes a coefficient update circuit to generate alternative power indicators for the lookup table, and thereby introduces a patentably distinct element in addition to the elements recited in Claim 1. The cited combination, however, does not teach or suggest the predistorter training circuit includes a coefficient update circuit to generate alternative power indicators for the lookup table in combination with the base claim limitations. Thus, the cited combination of Cova, Wessel and Wright does not establish a *prima facie* case of obviousness of dependent Claim 4. Accordingly, Claim 4 is nonobvious over Cova, Wessel and Wright and the Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of Claim 4.

C.   Rejection of Claims 5 and 12

The Examiner has rejected Claims 5 and 12 under 35 U.S.C. §103(a) as being unpatentable over the cited combination of Cova, Wessel and Wright. The above argument establishing the

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nonobviousness of independent Claims 1 and 8 is incorporated herein by reference. Dependent Claims 5 and 12 additionally require that the power indicators include both real and quadrature components, and thereby introduce a patentably distinct element in addition to the elements recited in Claims 1 and 8. The cited combination, however, does not teach or suggest the power indicators include both real and quadrature components in combination with the base claim limitations. Thus, the cited combination of Cova, Wessel and Wright does not establish a *prima facie* case of obviousness of dependent Claims 5 and 12. Accordingly, Claims 5 and 12 are nonobvious over Cova, Wessel and Wright and the Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of Claims 5 and 12.

D.   Rejection of Claims 6 and 13

        The Examiner has rejected Claims 6 and 13 under 35 U.S.C. §103(a) as being unpatentable over the cited combination of Cova, Wessel and Wright. The above argument establishing the nonobviousness of independent Claims 1 and 8 is incorporated herein by reference. Dependent Claims 6 and 13 additionally require, respectively, that the predistorter training circuit operates only in a training mode and employing both the power indicators and the digital compensation signal is carried out only in a training mode and thereby introduce a patentably distinct element in addition to the elements recited in Claims 1 and 8.

        The Examiner recognizes that Cova does not expressly disclose a trainer operates only in a training mode. (*See* Examiner's Final Rejection, page 12.) Nevertheless, the Examiner asserts that since the trainer of Cova operates when it is needed this equates to a training mode. (*See* Examiner's Final Rejection, page 12.) Operating when needed, however, suggests that Cova does not have a

designated training mode. Cova provides no suggestion of operating a training circuit only during a training mode. Instead, the trainer subsystem 605 of Cova periodically provides updates and receives batches of data containing samples. (*See* column 10, lines 41-54.) Thus, Cova does not teach or suggest operating only in a training mode as recited in Claims 6 and 13 but discloses a trainer subsystem that operates as needed.

Therefore, the cited combination including Cova, does not teach or suggest the patentably distinct elements of Claims 6 and 13 and does not teach or suggest these elements in addition to the elements recited in Claims 1 and 8. Thus, the cited combination of Cova, Wessel and Wright does not establish a *prima facie* case of obviousness of dependent Claims 6 and 13. Accordingly, Claims 6 and 13 are nonobvious over Cova, Wessel and Wright and the Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of Claims 6 and 13.

E.   Rejection of Claim 9

The Examiner has rejected Claim 9 under 35 U.S.C. §103(a) as being unpatentable over the cited combination of Cova, Wessel and Wright. The above argument establishing the nonobviousness of independent Claim 8 is incorporated herein by reference. Dependent Claim 9 additionally requires that the transmit chain includes: an interpolator coupled to an output of the digital predistorter, a digital to analog converter coupled to an output of the interpolator, a low pass filter coupled to an output of the digital to analog converter, a quadrature modulator coupled to an output of the low pass filter and an amplifier coupled to an output of the quadrature modulator in addition to the elements recited in Claim 8. The cited combination, however, does not teach or

suggest the limitations as recited in Claim 9 in combination with the base claim limitations.

Additionally, the Examiner asserts that Claim 9 is rejected on the same ground as for Claim 2 but rejects Claim 2 based on Cova, Wessel and Park. (*See* Examiner's Final Rejection, pages 12 and 13.) Regarding Claim 2, the Examiner asserts that Cova does not disclose an analog low pass filter coupled to an output of a digital-to-analog converter and cites Park to cure this deficiency. (*See* Examiner's Final Rejection, page 13.) Accordingly, the cited combination of Cova, Wessel and Wright does not establish a *prima facie* case of obviousness of dependent Claim 9. Thus, Claim 9 is nonobvious over Cova, Wessel and Wright and the Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of Claim 9.

F.   Rejection of Claim 10

The Examiner has rejected Claim 10 under 35 U.S.C. §103(a) as being unpatentable over the cited combination of Cova, Wessel and Wright. The above argument establishing the nonobviousness of independent Claim 8 is incorporated herein by reference. Dependent Claim 10 additionally requires that the receive chain includes: a quadrature De-modulator, a low pass filter coupled to an output of the quadrature De-modulator and an analog to digital converter coupled to an output of the low pass filter in addition to the elements recited in Claim 8. The cited combination, however, does not teach or suggest the limitations as recited in Claim 10 in combination with the base claim limitations.

Additionally, the Examiner asserts that Claim 10 is rejected on the same ground as for Claim 3 but rejects Claim 3 based on Cova, Wessel and Ha. (*See* Examiner's Final Rejection, pages 13 and 115-16.) Regarding Claim 3, the Examiner asserts that Cova does not disclose a low pass filter

coupled between an analog downconverter and an analog-to-digital converter and cites Ha to cure this deficiency. (*See* Examiner's Final Rejection, page 16.) Accordingly, the cited combination of Cova, Wessel and Wright does not establish a *prima facie* case of obviousness of dependent Claim 10. Thus, Claim 10 is nonobvious over Cova, Wessel and Wright and the Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of Claim 10.

G.   Rejection of Claim 11

The Examiner has rejected Claim 11 under 35 U.S.C. §103(a) as being unpatentable over the cited combination of Cova, Wessel and Wright. The above argument establishing the nonobviousness of independent Claim 8 is incorporated herein by reference. Dependent Claim 11 additionally requires that employing both the power indicators and the digital compensation signal comprises generating alternative power indicators for the lookup table in addition to the elements recited in Claim 8. The cited combination, however, does not teach or suggest that employing both the power indicators and the digital compensation signal comprises generating alternative power indicators for the lookup table in combination with the base claim limitations. Thus, the cited combination of Cova, Wessel and Wright does not establish a *prima facie* case of obviousness of dependent Claim 11. Accordingly, Claim 11 is nonobvious over Cova, Wessel and Wright and the Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of Claim 11.

<u>Rejection of Claim 2 under 35 U.S.C. 103(a) over Cova in view of Wessel and in further view of Park</u>

The Examiner has rejected Claim 2 under 35 U.S.C. §103(a) as being unpatentable over the cited combination of Cova, Wessel and Park. The above argument establishing the nonobviousness of independent Claim 1 is incorporated herein by reference. Dependent Claim 2 additionally requires the transmit chain include: an interpolator coupled to an output of the digital predistorter, a digital to analog converter coupled to an output of the interpolator, a low pass filter coupled to an output of the digital to analog converter, a quadrature modulator coupled to an output of the low pass filter and an amplifier coupled to an output of the quadrature modulator in addition to the elements recited in Claim 1. The cited combination, however, does not teach or suggest the limitations of Claim 2 in combination with the base claim limitations. Thus, the cited combination of Cova, Wessel and Park does not establish a *prima facie* case of obviousness of dependent Claim 2. Accordingly, Claim 2 is nonobvious over Cova, Wessel and Park and the Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of Claim 2.

<u>Rejection of Claim 3 under 35 U.S.C. 103(a) over Cova in view of Wessel and in further view of Ha</u>

The Examiner has rejected Claim 3 under 35 U.S.C. §103(a) as being unpatentable over the cited combination of Cova, Wessel and Ha. The above argument establishing the nonobviousness of independent Claim 1 is incorporated herein by reference. Dependent Claim 3 additionally requires the receive chain include: a quadrature De-modulator, a low pass filter coupled to an output of the quadrature De-modulator and an analog to digital converter coupled to an output of the low pass

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filter in addition to the elements recited in Claim 1. The cited combination, however, does not teach or suggest the limitations of Claim 3 in combination with the base claim limitations. Thus, the cited combination of Cova, Wessel and Ha does not establish a *prima facie* case of obviousness of dependent Claim 3. Accordingly, Claim 3 is nonobvious over Cova, Wessel and Ha and the Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of Claim 3.

Rejection of Claims 7 and 14 under 35 U.S.C. 103(a) over Cova in view of Wessel and in further view of Miyashita

The Examiner has rejected Claims 7 and 14 under 35 U.S.C. §103(a) as being unpatentable over the cited combination of Cova, Wessel and Miyashita. The above argument establishing the nonobviousness of independent Claims 1 and 8 is incorporated herein by reference. Dependent Claims 7 and 14 additionally require, respectively, that a root-raised cosine circuit provides the power indicator in addition to the elements recited in Claims 1 and 8. The cited combination does not teach or suggest a root-raised cosine circuit provides the power indicator in addition to the elements recited in Claims 1 and 8. Thus, the cited combination of Cova, Wessel and Miyashita does not establish a *prima facie* case of obviousness of dependent Claims 7 and 14. Accordingly, Claims 7 and 14 are nonobvious over Cova, Wessel and Miyashita and the Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of Claims 7 and 14.

Rejection under 35 U.S.C. 103(a) over Cova in view of Wessel and in further view of Park, Ha and Wright

A.   Rejection of Claim 15

The Examiner has rejected Claim 15 under 35 U.S.C. §103(a) as being unpatentable over the cited combination of Cova, Wessel, Park, Ha and Wright. The above arguments establishing the nonobviousness of independent Claim 1 and dependent Claims 2 and 3 are incorporated herein by reference. As discussed above regarding independent Claims 1 and 8, the Applicants do not find in Cova, Wessel or Wright, a teaching or suggestion of employing a receive chain of a WCDMA transceiver during a training mode to provide a digital compensation signal that is a function of an output of a transmit chain of the transceiver wherein the transceiver's antenna is disconnected from the transmit chain during the training mode as also recited in independent Claim 15. Park and Ha have not been cited to cure this noted deficiency. Accordingly, the cited combination of Cova, Wessel, Park, Ha and Wright fails to teach or suggest each element of independent Claim 15, and does not provide a *prima facie* case of obviousness of Claim 15.

Additionally, the cited combination of Wright with Cova is improper as argued above regarding Claim 1. The Examiner appears to have used the present invention recited in Claim 15 as a map to combine the six references using impermissible hindsight. Thus, for at least these reasons, the cited combination of Cova, Wessel, Park, Ha and Wright does not establish a *prima facie* case of obviousness of Claim 15. Accordingly, Claim 15 is nonobvious over these cited references and the Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of Claim 15.

B.   Rejection of Claim 16

The Examiner has rejected Claim 4 under 35 U.S.C. §103(a) as being unpatentable over the cited combination of Cova, Wessel, Park, Ha and Wright. The above arguments establishing the nonobviousness of independent Claim 15 and dependent Claim 4 are incorporated herein by reference. Dependent Claim 16 additionally requires that the predistorter training circuit includes a coefficient update circuit to generate alternative power indicators for the lookup table, and thereby introduces a patentably distinct element in addition to the elements recited in Claim 15. The cited combination, however, does not teach or suggest the predistorter training circuit includes a coefficient update circuit to generate alternative power indicators for the lookup table in combination with the base claim limitations. Thus, the cited combination of Cova, Wessel, Park, Ha and Wright does not establish a *prima facie* case of obviousness of dependent Claim 16. Accordingly, Claim 16 is nonobvious over Cova, Wessel, Park, Ha and Wright and the Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of Claim 16.

C.   Rejection of Claim 17

The Examiner has rejected Claim 17 under 35 U.S.C. §103(a) as being unpatentable over the cited combination of Cova, Wessel, Park, Ha and Wright. The above arguments establishing the nonobviousness of independent Claim 15 and dependent Claim 5 are incorporated herein by reference. Dependent Claim 17 additionally require that the power indicators include both real and quadrature components, and thereby introduce a patentably distinct element in addition to the elements recited in Claim 15. The cited combination, however, does not teach or suggest the power indicators include both real and quadrature components in combination with the base claim

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limitations. Thus, the cited combination of Cova, Wessel, Park, Ha and Wright does not establish a *prima facie* case of obviousness of dependent Claim 17. Accordingly, Claim 17 is nonobvious over Cova, Wessel, Park, Ha and Wright and the Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of Claim 17.

D.   Rejection of Claim 18

The Examiner has rejected Claim 18 under 35 U.S.C. § 103(a) as being unpatentable over the cited combination of Cova, Wessel, Park, Ha and Wright. The above arguments establishing the nonobviousness of independent Claim 15 and dependent Claim 6 are incorporated herein by reference. Dependent Claim 18 additionally require that the predistorter training circuit operates only in a training mode, and thereby introduce a patentably distinct element in addition to the elements recited in Claim 15. The cited combination, however, does not teach or suggest the predistorter training circuit operates only in a training mode in combination with the base claim limitations. Thus, the cited combination of Cova, Wessel, Park, Ha and Wright does not establish a *prima facie* case of obviousness of dependent Claim 18. Accordingly, Claim 18 is nonobvious over Cova, Wessel, Park, Ha and Wright and the Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of Claim 18.

E.   Rejection of Claim 19

The Examiner has rejected Claim 19 under 35 U.S.C. § 103(a) as being unpatentable over the cited combination of Cova, Wessel, Park, Ha and Wright. The above arguments establishing the nonobviousness of independent Claim 15 and dependent Claim 7 are incorporated herein by

reference. Dependent Claim 19 additionally requires that a root-raised cosine circuit provides the power indicator, and thereby introduce a patentably distinct element in addition to the elements recited in Claim 15. The cited combination, however, does not teach or suggest that a root-raised cosine circuit provides the power indicator in combination with the base claim limitations. Thus, the cited combination of Cova, Wessel, Park, Ha and Wright does not establish a *prima facie* case of obviousness of dependent Claim 19. Accordingly, Claim 19 is nonobvious over Cova, Wessel, Park, Ha and Wright and the Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of Claim 19.
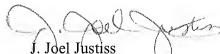

F.   Rejection of Claim 20

        The Examiner has rejected Claim 20 under 35 U.S.C. §103(a) as being unpatentable over the cited combination of Cova, Wessel, Park, Ha and Wright. The above argument establishing the nonobviousness of independent Claim 15 is incorporated herein by reference. Dependent Claim 20 additionally requires that the transceiver is located within a cellular telephone, and thereby introduces a patentably distinct element in addition to the elements recited in Claim 15. The cited combination, however, does not teach or suggest that the transceiver is located within a cellular telephone in combination with the base claim limitations. Thus, the cited combination of Cova, Wessel, Park, Ha and Wright does not establish a *prima facie* case of obviousness of dependent Claim 20. Accordingly, Claim 20 is nonobvious over Cova, Wessel, Park, Ha and Wright and the Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of Claim 20.

For the reasons set forth above, the Claims on appeal are not patentably nonobvious over the cited references. Accordingly, the Appellant respectfully requests that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of all of the Appellant's pending claims.

Respectfully submitted,

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VIII. APPENDIX A - CLAIMS

1. A WCDMA transceiver having an antenna, comprising:

a transmit chain having a lookup table that provides coefficients to a digital predistorter based on power indicators; and

a predistorter training circuit, coupled to said transmit chain, that employs a receive chain of said WCDMA transceiver during a training mode to provide a digital compensation signal that is a function of an output of said transmit chain and employs both said power indicators and said digital compensation signal to cause said lookup table to provide alternative coefficients to said digital predistorter thereby to reduce distortion in said output, wherein said antenna is disconnected from said transmit chain during said training mode.

2. The transceiver as recited in Claim 1 wherein said transmit chain comprises:

an interpolator coupled to an output of said digital predistorter;

a digital to analog converter coupled to an output of said interpolator;

a low pass filter coupled to an output of said digital to analog converter;

a quadrature modulator coupled to an output of said low pass filter; and

an amplifier coupled to an output of said quadrature modulator.

3. The transceiver as recited in Claim 1 wherein said receive chain comprises:

a quadrature De-modulator;

a low pass filter coupled to an output of said quadrature De-modulator; and

an analog to digital converter coupled to an output of said low pass filter.

4. The transceiver as recited in Claim 1 wherein said predistorter training circuit comprises a coefficient update circuit to generate alternative power indicators for said lookup table.

5. The transceiver as recited in Claim 1 wherein said power indicators include both real and quadrature components.

6. The transceiver as recited in Claim 1 wherein said predistorter training circuit operates only in a training mode.

7. The transceiver as recited in Claim 1 wherein a root-raised cosine circuit provides said power indicator.

8. A method of reducing distortion in an output of a WCDMA transceiver having an antenna, comprising:

employing a lookup table to provide coefficients to a digital predistorter of a transmit chain based on power indicators;

employing a receive chain of said WCDMA transceiver during a training mode to provide a digital compensation signal that is a function of an output of said transmit chain, said antenna disconnected from said transmit chain during said training mode; and

employing both said power indicators and said digital compensation signal to cause said lookup table to provide alternative coefficients to said digital predistorter.

9. The method as recited in Claim 8 wherein said transmit chain comprises:

an interpolator coupled to an output of said digital predistorter;

a digital to analog converter coupled to an output of said interpolator;

a low pass filter coupled to an output of said digital to analog converter;

a quadrature modulator coupled to an output of said low pass filter; and

an amplifier coupled to an output of said quadrature modulator.

10. The method as recited in Claim 8 wherein said receive chain comprises:

a quadrature De-modulator;

a low pass filter coupled to an output of said quadrature De-modulator; and

an analog to digital converter coupled to an output of said low pass filter.

11. The method as recited in Claim 8 wherein said employing both said power indicators and said digital compensation signal comprises generating alternative power indicators for said lookup table.

12. The method as recited in Claim 8 wherein said power indicators include both real and quadrature components.

13. The method as recited in Claim 8 wherein said employing both said power indicators and said digital compensation signal is carried out only in a training mode.

14. The method as recited in Claim 8 wherein a root-raised cosine circuit provides said power indicator.

15. A WCDMA transceiver having an antenna, comprising:

a transmit chain, including:

a digital predistorter,

a lookup table that provides coefficients to said digital predistorter based on power indicators,

an interpolator coupled to an output of said digital predistorter,

a digital to analog converter coupled to an output of said interpolator,

a low pass filter coupled to an output of said digital to analog converter,

a quadrature modulator coupled to an output of said low pass filter, and

an amplifier coupled to an output of said quadrature modulator;

a receive chain, including:

a quadrature De-modulator,

a low pass filter coupled to an output of said quadrature De-modulator,

an analog to digital converter coupled to an output of said low pass filter; and

a predistorter training circuit, coupled to said transmit chain, that employs said receive chain during a training mode to provide a digital compensation signal that is a function of an output of said transmit chain and employs both said power indicators and said digital compensation signal to cause said lookup table to provide alternative coefficients to said digital predistorter thereby to reduce distortion in said output, wherein said antenna is disconnected from said transmit chain during said training mode.

16. The transceiver as recited in Claim 15 wherein said predistorter training circuit comprises a coefficient update circuit to generate alternative power indicators for said lookup table.

17. The transceiver as recited in Claim 15 wherein said power indicators include both real and quadrature components.

18. The transceiver as recited in Claim 15 wherein said predistorter training circuit operates only in a training mode.

19. The transceiver as recited in Claim 15 wherein a root-raised cosine circuit provides said power indicator.

20. The transceiver as recited in Claim 15 wherein said transceiver is located within a cellular telephone.

IX. APPENDIX B - EVIDENCE

The evidence in this appendix includes Cova, Ha, Park, Wessel, Miyashita and Wright.

These references were applied by the Examiner as indicated in the above arguments.

X. RELATED PROCEEDINGS APPENDIX

NONE